California Environmental Protection Agency
AIR RESOURCES BOARD

AIR QUALITY SURVEILLANCE BRANCH

STANDARD OPERATING PROCEDURES

FOR

MET ONE INSTRUMENTS
Speciation Air Sampling System
(SASS)

AQSB SOP 401

First Edition

MONITORING AND LABORATORY DIVISION

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California Environmental Protection Agency
AIR RESOURCES BOARD

Approval of Standard Operating Procedures (SOP)

Title:	Met One Instruments Speciation Air Sampling System (SASS)
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1.0 GENERAL INFORMATION

1.1 Purpose:

The purpose of this Standard Operating Procedure (SOP) is to supplement the Met One Speciation Air Sampling System (SASS) Operator's Manual by describing modifications in hardware or operating procedures which may have been implemented by the Monitoring and Laboratory Division of the Air Resources Board (ARB). These modifications are designed to assure compliance with the Federal Reference Method (FRM) for collection of particulate matter 2.5 microns or smaller (PM2.5) when using the Met One Air Sampler. The intent of this document is not to duplicate the Met One Manual, and where applicable, this SOP refers to the Met One SASS operations manual.

1.2 General Description and Theory of Operation:

The Met One SASS is a five channel sampler designed to collect PM2.5 on three different collection media for speciation. The sampler operates at a volumetric flow rate of 6.7 liters per minute and provides the PM2.5 cut-point via a sharp cut cyclone. The particles collected on the Teflon filter can be used for mass and metals analysis. The particles collected on nylon can be used for ion analysis. The particles collected on the quartz fiber filters can be used for carbon analysis. All filters are 47 mm in diameter.

Electronic systems in the sampler are designed to monitor and maintain the volumetric flow rate as well as record the elapsed sampling time enabling the SASS to calculate the total sample volume in cubic meters (m^3). Using this information, the analyzing laboratory will calculate and report the average PM2.5 concentration for the sampling period in ug/m^3.

The SASS monitors and regulates the flow rates for all the channels using the sampler's microprocessor, software, mass flow controller, ambient temperature sensor, and ambient pressure sensor. The valid sampling period must be between 23 and 25 hours. The flow rate of the sampler must be 6.7 LPM ± 4%. The sampler, along with the analytical analyses, can generate results for 58 different air quality parameters.

Data from a previous run can be downloaded to a laptop or PC via a RS232 cable and the SASSCOMM AQ software or the data can be accessed from the screens on the instrument.

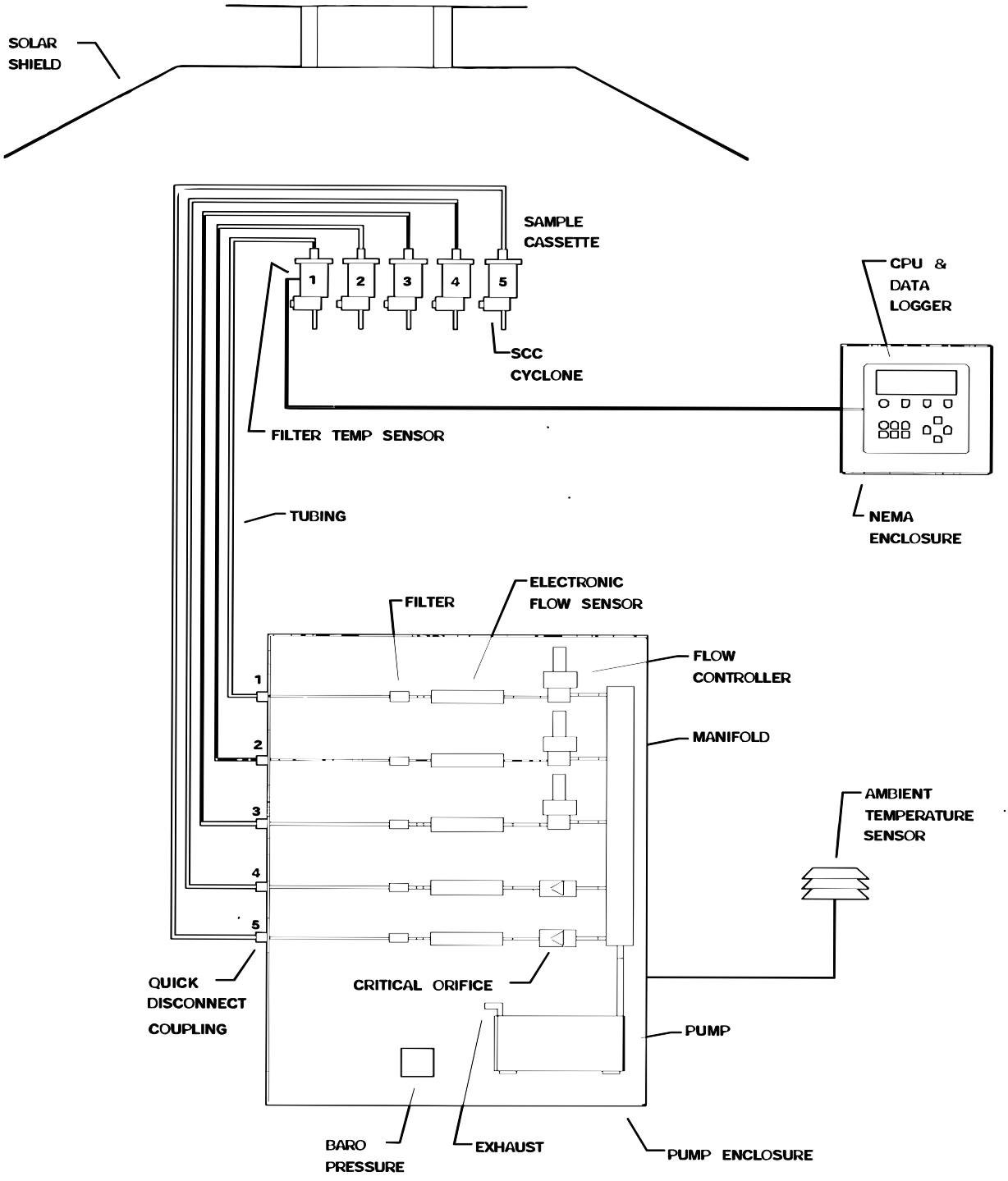

Figure 1. Schematic of Met One SASS Sampler.

1.3 Safety:

Think “safety first”. High (120 volts A.C.) voltage is used to power the unit. Watch where and how you place your hands in the sampler. Unplug the sampler whenever possible while working around electrical components. Working outdoors in wet weather conditions increases the risk of electrocution.

Rooftop sampling creates a hazard from falling. Be careful climbing and descending to and from the rooftop platform. For additional safety information read Section 2.0 Unpacking, Siting, and Installation Section of the Met One SASS Operating Manual and the Air Quality Surveillance Branch Safety Manual.

Ensure that the green grounding cable is installed.

2.0 INSTALLATION PROCEDURE

2.1 Physical Inspection:

Inspect equipment and accessories for completeness and check for any shipping damage upon receipt of a SASS sampler. If equipment is missing or damage is found immediately notify your supervisor and/or your agency's shipping department.

2.2 Siting:

Siting of the SASS will be dictated by the type of sampling to be conducted. An effort should be made to meet siting guidelines stated in the Code of Federal Regulations, Title 40 Part 58. Ensure the sampler inlet is separated by at least 1m, but not more than 4m, from other PM2.5 samplers and that the sampler has an unobstructed airflow of a minimum of 2m in all directions. For collocated sampler studies position the sampler inlets exactly 1 meter apart.

2.3 Tools:

The SASS sampler contains a tool kit that has the equipment necessary for assembly of the sampler. A drill is required to bolt the tripod and pump box to the ground. Review the operator's manual and the steps below completely before installing.

2.4 Tripod Assembly:

Remove the three pins holding the legs in the upright position. Lower the legs and reinsert the pins to lock the legs in the down position. The tripod must be anchored to the ground to ensure that it will not tip over in strong wind or inclement weather. If the platform is made of wood, 1/3'' lag screws are advised.

2.5 Sampling Head Installation:

The bottom and top shields of the sampling head are attached when shipped. Detach the bottom shield and slide it past the hoses and cables that are attached to the upper sampling head. Remove the pin on the side of the bottom shield. Slide the shield down the tripod with the open side of the shield facing upwards.

Find the bag of three 8-32 x 3/16'' socket head screws in the tool kit. The correct screws have been treated with a red thread locking compound. Install two screws into the two tapped holes in the mast.

Remove the gray PVC shipping tube from the center of the upper sampling head. Unwind the cabling attached to the sampling head. Feed the cables down the

center of the mast and slide the head onto the mast. Aligning the notch in the sampling head with the upper socket head screw in the mast allows the head to slide completely downward. Tighten the two socket head screws in the sampling head to secure it to the mast. Raise the bottom shield and align the notch with the lower set screw in the mast. Put the pin in place to lock the shield in the raised position.

2.6 Control Unit and Temperature Sensor Mounting:

Using two U-bolts, four 7/16" nuts, and four washers, mount the control unit just above the tripod legs. The control unit will face upwards with the cable connections on the bottom when properly oriented.

The temperature sensor mounts to the tripod with a U-bolt, two 7/16" nuts, and washers. Align the top of the probe's radiation shield with the top of the control box. Place the sensor so that it is oriented 180° in relation to the control box.

2.7 Pump Box Mounting:

Place the pump box close to the base of the tripod to ensure that all cable connections can be made. Anchor the pump box using lag bolts or other appropriate hardware. There are pre-drilled holes in the legs of the unit for this purpose.

Plug the pump box power cord into a 110V AC power source. Connect the sensor cable and the control box power cable into the control box. There are 5 quick-disconnect valve connectors on the pump box numbered 1-5. These numbers correspond to the channels on the SASS sampling head. Each pump line from the head is numbered; connect each line to the corresponding quick-disconnect valve. Channels four and five can be connected or the pump lines and valves can be left disconnected. If channels four and five are disconnected, place the orange caps over the sample lines. Connect the green and yellow grounding cable to an appropriate ground source.

2.8 Sample Canister Mounting:

The sample canisters will contain the necessary filters and denuders when they arrive from the laboratory. The sharp-cut cyclone inlets (SCC) must be installed and the sample canisters must be placed onto the appropriate channels in the sampling head. Placing a very small amount of o-ring lubricant (silicone grease) on the o-rings will facilitate insertion of the cyclone and the canister. Remove the plugs on both ends of the sample canister. The SCC is inserted into the side of the canister with only one lock screw. Rotate the SCC until the metal plate on the cyclone locks into the lock screw on the canister. From this point on ensure the canister is oriented SCC side down to keep the filters from being contaminated.

The two lock screws on the upper side of the canister are inserted into the guides on the sampling head. Align the lock screws with the wider portion of the guides, ensuring that the mark on the canister faces outward. Push the canister upward and rotate counterclockwise to lock it into place. A small amount of silicone grease on the o-rings will make it easier to install the canisters and avoid o-ring damage. Once all the canisters have been installed raise the radiation shield and lock it in place.

3.0 CONFIGURATION

3.1 Time and Date Setup:

Press the “SETUP” soft key in the main menu to set the date and time. Press “F3” to get to the clock menu. Use the left and right arrows to move the cursor. Use the up and down arrows to adjust values as necessary. Set sampler time to current Pacific Standard Time.

3.2 Event Setup:

Press the “SETUP” soft key to begin programming a sampling event. Press “F1” to activate the event manager. Set the start date and time using the up and down arrow keys to change values and the left and right arrow keys to move the cursor. Edit the event length time to the desired run interval (The default run interval is 24 hours). Choose the canister set to be activated (default is 1, 2, 3). Press “SAVE” to store the event. The SASS allows up to four events to be preprogrammed. Press “F1” to review the event to ensure proper storage and setup, and then select “EXIT” to go to the main menu.

4.0 SAMPLE CANISTER HANDLING AND SHIPMENT

4.1 Canister Handling:

The sampling canisters and leak check canisters must be capped when not on the SASS. Remove the sampling canisters within 48 hours after sampling. To remove the canister, rotate the canister clockwise until it stops and pull down. While keeping the SCC end pointed downwards, twist the SCC until the metal plate disengages from the locking screw and remove. Cap the ends of the canister and store in a refrigerator. The canisters may be stored in a freezer if a refrigerator is not available. Ship the canisters within 96 hours after sampling.

4.2 SCC Inlets:

Use each inlet on the same channel for every sampling event.

4.3 Field Blanks:

Field blanks will be shipped from the laboratory every 10^{th} sample. They will have a separate Custody and Field Data Form (Appendix C). The field blanks will be labeled with channel numbers and colored dots. Install the field blanks prior to installing normal run canisters. Install the field blanks in channels 1-3 as labeled with the inlets installed for approximately 3-5 minutes. Remove the canisters and the cyclones, cap the ends of the field blank canisters, and return to the shipping bin. Install routine sampling canisters according to schedule.

5.0 DATA RETRIEVAL

5.1 General Information:

The event summary can be manually retrieved by navigating the event summary screens on the control box display. Use the Previous Event Summary option on the event menu to retrieve chain of custody data. The event summary information can also be downloaded with the SASSCOMM AQ software. The SASS sampler can store the 5-minute data for one run. If 5-minute data is needed for a run it must be collected before the next run. If the 5 minute data is required, it must be downloaded via the SASSCOMM AQ software.

5.2 Hardware Setup:

The included RS-232 Cable (Met One part # 3169) must be used for communication with the SASS. Place the round four pin connector into the appropriate connector on the SASS sampler. Next place the nine pine serial port connector onto the serial port of the laptop. Note the com port setting on the serial port.

5.3 SASSCom AQ Software:

To download run data from the SASS Control box with a laptop use the SASSCom AQ software. Ensure that the cables are connected properly and start the software. Select the com port corresponding to the serial port used by the SASS, and click on the “Retrieve Data” button. If only the event data summary is needed, choose yes at the “Would You Like To Only Download the Event Data” screen. If 5-minute data is desired choose no. Data can either be viewed within the program or exported as a comma-delimited text file for import into a spreadsheet. Two files are downloaded for each run. The .bin files are SASSCOMM AQ formatted. The .csv files are comma-delimited text files that can be viewed with most spreadsheet software.

6.0 CALIBRATION PROCEDURES

6.1 General Information:

This section of the SOP covers the calibration procedures for the Met One SASS. This document is intended to supplement the manufacturers operating manual and should not be used as a substitute. Read the procedures outlined in this document and examine the user's manual before attempting to calibrate a SASS unit.

The SASS sampler requires calibration of the ambient temperature sensor, barometric pressure sensor and each flow controller. Perform the SASS sampler calibration using the following steps:

1. Time Verification
2. Leak Check
3. Temperature Sensor Calibration
4. Pressure Calibration
5. Flow Calibration

6.2 Apparatus for Met One SASS Calibration:

A NIST traceable Flow Transfer Standard
A NIST traceable time standard
A NIST traceable pressure and temperature (P/T) standard
3 Sharp Cut Cyclones (SCC)
3 Calibration Canisters
Calibration worksheet
Teflon, quartz, and nylon filters for calibration.
Two 1 to 2 liter vessels for temperature calibrations
A hot plate
A bag of ice
A gas-tight syringe (@ 60 cc capacity), tubing with a "tee"
Fittings to connect to the P/T standard and the sampler's pressure transducer inlet
Met One SASS Manual
Basic set of tools

6.3 Pre-Calibration Preparations:

Install the correct filters in each calibration canister to simulate flow conditions during sampling. Use a Teflon filter in channel one, a nylon filter in channel two, and a quartz filter in channel three. Use these canisters only for calibrations, verifications, and leak tests.

Plug and turn on a pressure and temperature standard and let it warm up for about ½ hour. Place the P/T standard in the shade if possible.

Prepare the SASS calibration worksheet while waiting for the P/T standard to warm up.

6.4 Time Verification:

Press the “Setup” Key from the main menu. Press “F1” to choose time menu. Compare the clock setting on the sampler with a time standard. Enter the date and time in the laptop calibration spreadsheet for both the sampler and the NIST time standard. If the sampler clock is not within 5 minutes of “true” use the left and right arrow keys to move the cursor and the up or down arrow keys to adjust the time. Press “Save” before exiting. Record the values in the calibration worksheet.

6.5 Ambient Temperature Sensor Calibration:

The ambient temperature sensor must be accurate to ± 2 °C because the SASS sampler flow rates are calculated in volumetric flow. Calibrate the ambient temperature sensor upon installation. The ambient temperature sensor must be removed from the ambient temperature sensor shield before beginning the calibration. Once the sensor has been removed from its housing, follow the steps described below to complete the calibration.

The calibration procedure requires water, a hot plate, ice and containers to hold the water. Two points are necessary for a calibration. An ice bath is used to provide a 0 °C reference point, and the second should be a water bath of a high temperature (50 °C is a common point). Use the following steps to calibrate the temperature sensor:

1. Enter the Calibration menu. Press “F3” to select the “Temperature Calibration” screen. Press the Up and Down arrows until the display reads "(0)" in the upper left corner. The "0" indicates the ambient temperature sensor calibration screen.

2. Prepare an ice bath. Place the temperature standard and the ambient temperature probe into the bath in close proximity to each other. Allow the probes to equilibrate for 5 minutes.

3. Enter the reading from the temperature standard into the reference column for point 1.

4. Press “F1” to save this reference point.

5. Repeat step 2 with a 50 °C water bath.

6. Enter the reading from the temperature standard into the reference column for point 2. Press “F4” to save this reference point. Once points one and two have been saved, press the “Calibrate” soft button to save the settings.

7. Perform a temperature verification on the SASS sensor. If the ambient sensor is in excess of ± 2 °C from the standard, perform another calibration. If the sensor is still not within acceptable parameters the SASS will need repair.

8. Record results on the calibration worksheet.

6.6 Filter Temperature Sensor Calibration:

The filter temperature sensor must be accurate to ± 2 °C because the SASS sampler flow rates are calculated in volumetric flow. Calibrate the filter temperature sensor upon installation. The filter temperature sensor must be removed from channel 1 in the sampling head. Once the sensor has been removed from the sampling head, follow the steps described below to complete the calibration.

The calibration procedure requires water, a hot plate, ice and containers to hold the water. Two points are necessary for a calibration. An ice bath is used to provide a 0 °C reference point, and the second should be a water bath of a high temperature (50 °C is a common point). Use the following steps to calibrate the temperature sensor:

1. Enter the Calibration menu. Press “F3” to select the “Temperature Calibration” screen. Press the up and down arrow keys until the Display shows "(1)" in the upper left corner. The "1" indicates the filter temperature sensor calibration screen.

2. Prepare an ice bath. Place the temperature standard and filter temperature probe into the bath in close proximity to each other. Allow the probes to equilibrate for 5 minutes.

3. Enter the reading from the temperature standard into the reference column for point 1.

4. Press “F1” to save this reference point.

5. Repeat step 2 with a 50 °C water bath.

6. Enter the reading from the temperature standard into the reference column for point 2. Press “F4” to save this reference point. Once points one and two have been saved, press the “Calibrate” soft button to save the settings.

7. Perform temperature verification on the SASS sensor. If the ambient sensor is in excess of ± 2 °C from the standard, perform another calibration. If the sensor is still not within acceptable parameters the SASS will need repair.

8. Record results on the calibration worksheet.

6.7 Pressure Sensor Calibration:

Since the SASS sampler uses volumetric flow the pressure sensor must be accurate to ± 10 mm Hg. Open the pressure port on the P/T standard to ambient. (Sometimes there are plugs at the inlet of the sensor to keep dust out). Allow the pressure standard to warm up for at least ½ hour before performing a verification/calibration.

The barometric pressure sensor is located in the pump box housing. To access the sensor, unscrew the four (4) screws along the bottom of the housing and remove the cover. The pressure test port next to the power supply housing. This procedure will require a gas tight syringe, tubing and a tee. This is a 2-point calibration at 600 and 800 mm Hg. The following steps outline the pressure sensor calibration procedure.

1. In the “Calibrate” menu press “F4” to reach the “Pressure Calibration” Menu.

2. Connect the SASS pressure test port, the syringe, and P/T standard test port together with tubing and the tee.

3. Adjust the syringe plunger until the P/T standard reads 600 mm Hg. Enter the value on the P/T standard into the reference column on point 1. Press “F1” to save the setting.

4. Adjust the syringe until the P/T standard reads 800 mm Hg. Enter the value on the pressure standard into the reference column on point 2 in the control panel display. Press “F4” to save the setting.

5. Press the “Calibrate” soft button to save the calibration points. Remove the syringe and tubing and re-check both the 600 and 800 mm Hg points. If the sensor still exceeds ± 10 mm Hg of the standard, perform another calibration. If it still exceeds the ± 10 mm Hg limit, the sampler must be serviced.

6.8 Leak Test:

To perform a leak check, install canisters with appropriate filters to each channel to be checked. A canister with a Teflon filter must be installed in channel one. A canister with a nylon filter must be installed for channel two. A canister with a quartz fiber filter must be installed in channel three. Sharp cut cyclones must be installed on all of the canisters.

Press the “Calibrate” key in the main menu. Press “F1” to enter the “System Test” screen. Select “Calibrate Flows”. Press “Pump On” the turn on the pump. Let the sampler operate for about 5 minutes to warm up.

Observe the flows on the first three channels. The observed flow rate should be close to 6.7 ± 4% LPM. Press the "Leak" key. Cover the inlet of the sharp cut cyclone on channel one. Observe the flow rate displayed for channel one. The flow rate should drop to 0.1 LPM or less. Ensure that the flow remains at or below 0.1 LPM for at least 30 seconds. If the display remains at or below 0.1 LPM that channel passes the leak test. Slowly remove the cover from the inlet to keep the filter from breaking. Record the results in the laptop calibration spreadsheet. Repeat this procedure for channels two and three. Record the values on the calibration worksheet.

6.9 Flow Calibration Setup:

The current version of the SASS sampler has 5 channels for flow. The first three channels are designed to operate at 6.7 LPM. The last two channels are designed to operate at 6.9 LPM. Channels one, two, and three have active flow control. Mass flow controllers on the channels actively maintain a constant flow. Channels four and five have a critical orifice to maintain the flow. Flow through these orifices can vary significantly if there is a large amount of filter loading. Therefore, channels one, two, and three are the only channels that should be used for sampling.

The SASS samplers are operated in the “volumetric” flow mode. Therefore it is necessary to ensure that the temperature and pressure sensors are within acceptable limits before performing flow calibrations.

Install the calibration canisters. A Teflon filter must be installed in channel one. A nylon filter must be installed for channel two. A quartz fiber filter must be installed in channel three. Sharp cut cyclones must be installed on all of the canisters.

6.10 Flow Calibration:

If the flow rate for any channel is greater than ± 4% of the 6.7 LPM, that channel must be calibrated. Use the following procedure for calibration.

1. Press “F2” in the Calibration menu to reach the “Flow Calibration” screen. Press “Pump” to turn the pump on. Allow the pump to warm up for 5 minutes, and then connect the flow standard to the channel to be calibrated.

2. Place the cursor on the “Channel” column and use the up and down arrows to scroll to the correct channel. Read or calculate the volumetric flow rate on the

transfer standard. Equations for converting standard flow to volumetric flow can be found in the previous section if needed. Enter the volumetric flow rate in the "Ref" column and press the "Calibrate" key. Within 20 seconds the system will update with the new displayed flow rate on the SASS display. Exiting out of the calibration screen and returning will ensure that the SASS software has updated the calibration.

3. Check the updated flow rate on the SASS against the transfer standard. If the actual flow is not within ± 2% of the displayed flow, repeat step 2. The displayed flow must also be within ±2% of 6.7 LPM. Repeat the calibration procedure if the SASS does not meet the ±2% requirement. Once the calibration is complete, record the displayed and actual flow values into the calibration sheet.

4. Repeat the previous steps for the other two channels. When complete, ensure that the calibration sheet has been completely filled out. Turn off the sampler and remove the calibration canisters. Plug the ends of the calibration canisters to preserve them for the next flow test. Exit the calibration screen and return to the main menu.

A copy of the laptop calibration form is illustrated in Appendix B.

7.0 VERIFICATION PROCEDURES

7.1 General Information:

The SASS sampler requires verification of the ambient temperature sensor, barometric pressure sensor and each flow controller. Perform the SASS sampler verification using the following steps:

1. Time Verification
2. Temperature Verification
3. Pressure Verification
4. Flow Verification
5. Leak Check

7.2 Ambient Temperature Sensor Verification:

Place temperature probe of the P/T standard within the radiation shield of the ambient temperature sensor. If using the BGI Deltacal, use the external temperature probe. Avoid direct contact of the sensor to direct sunlight. The temperature probe must be within the radiation shield for at least 5 minutes.

1. Press the “Calibrate” key. Press “F1” to reach the “System Test” screen.

2. Observe and record the ambient temperature value on the system test screen on the maintenance check sheet.

3. Read or calculate the true temperature with the transfer standard’s slope and intercept and determine the difference of the sampler from true. Record the value on the worksheet. If the difference from true is less than ± 2 °C, the ambient temperature sensor passes. If the difference from true is greater than ± 2 °C, the ambient temperature sensor fails and must be calibrated. The calibration procedures are detailed in section 6.0, Calibration Procedures.

7.3 Filter Temperature Sensor Verification:

Place temperature probe of the P/T standard into the port of channel 1 on the sampling head. If using the BGI Deltacal, use the external temperature probe. Avoid direct contact of the sensor to direct sunlight. The temperature probe must be within the port for at least 5 minutes.

1. Press the “Calibrate” key. Press “F1” to reach the “System Test” screen.

2. Observe and record the ambient temperature value on the system test screen on the maintenance check sheet.

3. Read or calculate the true temperature with the transfer standard’s slope and

intercept and determine the difference of the sampler from true. Record the value on the worksheet. If the difference from true is less than ± 2 °C, the ambient temperature sensor passes. If the difference from true is greater than ± 2 °C, the ambient temperature sensor fails and must be calibrated. The calibration procedures are detailed in section 6.0, Calibration Procedures.

7.4 Pressure Sensor Verification:

Since the SASS sampler uses volumetric flow the pressure sensor must be accurate to ± 10 mm Hg. The pressure port on the P/T standard needs to be open to ambient. (Sometimes there are plugs at the inlet of the sensor to keep dust out). Allow the pressure standard to warm up for at least ½ hour before performing a verification.

1. Press the "Calibrate" key in the main menu. Press "F1" to reach the "System Test" screen.

2. Observe and record the values of the sampler's ambient pressure sensor in the laptop calibration sheet. Read or calculate the pressure value from the pressure standard and enter it into the maintenance check sheet.

3. If the difference from true is less than ± 10 mm Hg, the ambient pressure sensor passes. If the difference from true pressure is greater than ± 10 mm Hg, the ambient pressure sensor fails and the pressure sensor must be calibrated. The calibration procedure is outlined in the section 6.0, Calibration Procedures.

7.5 Flow Verification:

1. Press the "Calibrate" soft key. Press "F1" to get to the system test screen.

2. Press the "Pump" soft key. Allow the pump to run for 5 minutes.

3. Connect the flow transfer standard to the channel 1 inlet. If using a transfer standard that gives standard flow you must convert it to volumetric flow. Use the following equation:

$$\text{Volumetric flow} = \frac{(\text{std. flow*})(760\text{ mm Hg})(\text{ambient temp in K})}{(\text{ambient pressure in mm Hg})(298\text{ K})}$$

***Note**: the equation for standard flow used above is:

$$\text{std. flow} = [(\text{MFM disp})(\text{MFM cert. slope})] + (\text{MFM cert. intercept})$$

The above calculations are not necessary if your transfer standard reports volumetric flow directly. The flow should be within ± 4% of the displayed SASS

flow and the SASS should display a flow within ± 4% of 6.7 LPM. Record the SASS displayed flow and the transfer standard flow on the maintenance check sheet.

4. Repeat step 3 with channels 2 and 3. If a channel does not pass the flow verification that channel must be calibrated. Record displayed and actual flow rates on the monthly check sheet or calibration sheet as required.

7.6 Leak Check:

To perform a leak check, install canisters with appropriate filters to each channel to be checked. A canister with a Teflon filter must be installed in channel one. A canister with a nylon filter must be installed for channel two. A canister with a quartz fiber filter must be installed in channel three. Sharp cut cyclones must be installed on all of the canisters.

Press the “Calibrate” key in the main menu. Press “F1” to enter the “System Test” screen. Select “Calibrate Flows”. Press “Pump On” the turn on the pump. Let the sampler operate for about 5 minutes to warm up.

Observe the flows on the first three channels. The observed flow rate should be close to 6.7 ± 4% LPM. Press the "Leak" key. Cover the inlet of the sharp cut cyclone on channel one. Observe the flow rate displayed for channel one. The flow rate should drop to 0.1 LPM or less. Ensure that the flow remains at or below 0.1 LPM for at least 30 seconds. If the display remains at or below 0.1 LPM that channel passes the leak test. Slowly remove the cover from the inlet to keep the filter from breaking. Record the results in the laptop calibration spreadsheet. Repeat this procedure for channels two and three. Record the values on the maintenance check sheet.

8.0 ROUTINE SERVICE CHECKS

8.1 General Information:

Perform the following checks on the SASS Sampler at the intervals specified in the service schedule. The checks may be performed more frequently but should be performed at least at the prescribed intervals. Document all results and maintenance on the SASS Monthly Quality Control Maintenance Check Sheet. Maintain a set of loaded test canisters solely for the purpose of leak and flow checks. Do not use actual sample canisters to perform for leak and flow checks.

8.2 Daily Checks:

Review event logs after each run to ensure proper operation of the SASS sampler. Complete sample data sheet and return to lab with sampled cartridges.

8.3 Monthly Checks:

Complete the SASS Monthly Quality Control Maintenance Check Sheet and return to your supervisor. A time/date must be done monthly. Compare SASS date and time against an accurately set watch and adjust accordingly.

Perform a leak check monthly. Use loaded leak/flow test canisters and SCC inlets during flow checks. The sampler display must read 0.1 LPM or less to pass. Refer to Section 6.11 for the leak check procedure.

Perform an inlet flow check for all channels in use. The flow rate must be 6.7 LPM ± 4%. The flow checks must be done with loaded test canisters and SCC inlets in place.

The temperature and pressure sensors must be checked monthly. The temperature sensors must be within ± 2 °C of the temperature standard. The pressure sensor must be within ± 10 mm Hg of the pressure standard. If either sensor is out of tolerance, perform a multi-point calibration or replace the faulty sensor.

8.4 Semi-Annual Checks:

Perform semi-annual verification/calibration of the external ambient temperature sensor, filter temperature sensor, pressure sensor, and volumetric flow controller.

9.0 MAINTENANCE PROCEDURES

9.1 General Information:

Normal SASS maintenance requires keeping the SASS sampling head, pump box, and control unit dust free and inlet cleaning.

9.2 Sampler Maintenance:

The control box, OT sensor shield, and pump box should be cleaned when required with a clean wet cloth. The sampling shield should be cleaned whenever canisters are changed to minimize chances for contamination and to maximize effectiveness of the radiation shield.

9.3 PM2.5 Sharp Cut Cyclone (SCC) Maintenance:

Clean the SCC inlet monthly. Remove the inlet from the sampling canister before cleaning. Remove the grit cup and clean with compressed air or a lint-free cloth. Disassemble the SCC and clean the inner chamber of the SCC with a lint-free cloth. Check all o-rings (grit cup, inlet head, body) for damage and replace if necessary. Reassemble cyclone.

9.4 Pump Box Maintenance:

Clean and inspect the pump box once a quarter. Remove the four screws on the corners and lift the cover off the assembly. Clean the inside of the pump box with a brush or compressed air. Pay special attention to the screen located below the pump assembly. Replace the cover by first tightening the two screws on the fan exhaust side first, then tighten the screws on the opposite end of the enclosure.

10.0 TROUBLESHOOTING

10.1 General Information:

The SASS manual contains a table of symptoms and common solutions. Examining the event log data can be an important source of information when troubleshooting the SASS units.

CARB MONTHLY QUALITY CONTROL MAINTENANCE CHECK SHEET
Met One SASS Sampler

Operator Information

1) Daily Checks: Review Event Logs to ensure proper SASS operation.
2) Monthly Checks: Submit SASS Monthly Quality Control Maintenance Sheet. Clean SCC Inlets. Perform a leak check. Perform inlet flow checks. Perform temperature and pressure sensor checks.
3) Semi-Annual Checks: Perform verification/calibration of the external ambient temperature sensor, pressure sensor, and volumetric flow controller. Date Last Performed: _____

A. SITE AND SAMPLER INFORMATION

1. Site Name _____
2. Site Number _____
3. Operator/Agency _____
4. Month/Year _____
5. Sampler Make/Model _____
6. Sampler ID Number _____

B. DATE AND TIME CHECKS

Sampler Display date/time	Transfer Standard date/time	Date and Time Agree ± 5 min?	Action Taken

C. LEAK CHECKS

Channel Number	Manufacturer's Specifications Met?	Action Taken And Recheck Results
1		
2		
3		

D. TEMPERATURE VERIFICATION

Transfer Standard Name: _____
Transfer Standard ID: _____

Sensor Location	Sampler Display (ºC)	Transfer Standard (ºC)	Agreement ± 2 ºC?	Action Taken And Recheck Results
Ambient				
Filter				

E. PRESSURE CHECKS

Transfer Standard Name: _____
Transfer Standard ID: _____

Sensor Location	Sampler Display (mm Hg)	Transfer Standard (mm Hg)	Agreement within ± 10 mm Hg?	Action Taken And Recheck Results
Ambient				

F. FLOW RATE CHECKS

Transfer Standard Name: _____
Transfer Standard ID: _____

Channel Number	Sampler Display (L/min)	Transfer Standard Display (L/min)	Design Flow Rate (L/min)	Agreement within ± 4 percent?	Action Taken and Recheck Results
1					
2					
3					

Comments _____

APPENDIX A

ARB Calibration Report - Met One SASS Sampler

ID Information:	
Station Name:	Visalia
AIRS #:	61072002
Station Address:	310 N. Church
Agency:	ARB
Operator:	Jung

Instrument:	
Make:	Met One
Model #:	SASS
Pump Property #:	20020850
Pump Serial #:	A5511
Control Box Property #:	20020855
Control Box Serial #:	A5523

Calibration:	
"As Is"	X
"Final"	X
Calibration Date:	12/17/01
Report Date:	12/27/01
Prev. Cal. Date:	NA

Pressure/Temperature STD:

Make & Model:	BGI Deltacal
Property Number:	0024
Cert. Date:	09/28/00
Cert. Exp.:	08/07/03

Time:	Sampler:	Standard:
Date:	12/17/2001	12/17/2001
Hours:Minutes:Secs	4:23:37 PM	4:23:00 PM

Flow Transfer Standard:

Make & Model:	BGI Deltacal
I.D. #:	0024
Cert. Date:	09/28/00
Cert. Exp.:	08/07/03

Leak Test: (LPM)

Channel 1	0.0	
Channel 2	0.0	
Channel 3	0.0	

Time Standard:

Make & Model:	
Identification No.:	
Cert Date:	

Temperature: (deg. C)			Differ. from True:
Ambient	12.7	12.1	-0.6
Filter	13.1	12.1	-1.0

Pressure: (mm Hg)			Differ. from True:
Ambient	757	757	0.0

Volumetric Flow Tests: (LPM)	Sampler Display:	Flow Transfer STD: (in LPM)	Volumetric Flow vs Design Flow: (+/- Percent)	Volumetric Flow vs Sampler Display (+/- Percent)
Channel 1 (Teflon)	6.70	6.71	0.15	-0.15
Channel 2 (Nylon)	6.70	6.70	0.00	0.00
Channel 3 (Quartz)	6.70	6.70	0.00	0.00

Comments:			
Calibrated by:	MPQ	Checked by:	

APPENDIX B

PM 2.5 SPECIATION CUSTODY AND FIELD DATA FORM	Bar Code

CHAIN OF CUSTODY RECORD (INITIALS, DATE, TIME)

Lab Out _____ Site Out _____

Site In _____ Lab In _____

Bin ID Temperature at receipt (°C)

SITE INFORMATION

Site Name _____ Date Sampler Loaded _____

Scheduled Sampling Day Operator's Name

SAMPLER CHANNEL / CANNISTER ASSIGNMENTS

Channel #	Cannister #	Cannister Description	
1		Green - Teflon Filter - Mass / Metals	
2		Red - Nylon Filter - Ions	Denuder #
3		Orange - Quartz Filter - OC/EC	

SAMPLE START, END, AND RETRIEVAL INFORMATION

Channel #	Start Date	Start Time	End Date	End Time	Retrieval Date	Retrieval Time	Event Length
all							

SAMPLER COLLECTION INFORMATION

Channel #	Average Ambient P (mm Hg)	Sample Volume (M^3)	Average ambient Temp(°C)	Average Filter 1 Temp(°C)	Flow CV (%)	Mean Flow (L/min)	Flow Warning
1							Yes / No
2							Yes / No
3							Yes / No

	Ambient Temp(°C)	Filter 1 Temp(°C)	Ambient P (mm Hg)	Elapsed Time Warning	Filter dT Warning
Maximum				Yes	Yes
Minimum				No	No

Local Condition Codes: **A** (High Winds) **E** (Forest Fire) **F** (Structure Fire) **I** (Unusual Traffic Congestion) **J** (Construction Nearby) **K** (Farming Nearby) **L** (Highway Construction) **N** (Sanding/Salting Streets) **P** (Roofing Operations) **Q** (Prescribed Burn)

Comments

MASS ANALYSIS

Weight	Mass (ug)	Duplicate Mass (ug)	Date	Analyst
Pre				
Post				

Start Post-Conditioning _____ 01/31/2002

Appendix C